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Considerations for patients with psoriasis travelling under immunosuppression

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Summary

With the establishment of modern systemic therapies for psoriasis, comprehensive consultation is required for travelling with immune modulation. Logistic aspects regarding transport and storage, climatic peculiarities of the country of travel and drug dependent risks regarding infections must be considered. Vaccinations and preventive measures are emphasized. Depending on the current national recommendations, special features of vaccinations while under immunosuppression must be taken into account.

Introduction

With the rapid increase in therapeutic options for patients with moderate or severe psoriasis in recent years, the primary therapeutic aim is no longer an improvement of symptoms, but rather their complete elimination. Corresponding to a reduction of the PASI by more than 75 % (PASI75), thus making it possible for patients to participate in professional life and taking a more active role in public life. As a consequence, also their amount of travelling increases. Limitations in mobility and representation are no longer based on appearance and symptoms of the inflammatory skin disorder, but on the medication needed, which in turn requires certain conditions and a particular handling, such as regular doctor‘s visits and laboratory controls. The marked increase in prescriptions of biologics in recent years together with the high German travel activity, implies a steady increase in the number of affected travelers [1, 2]. Especially for travelling, an attending physician has several aspects to consider. Therefore, we would like to provide practical advice on therapy planning for travelers, also taking into account currently available systemic therapies for psoriasis.

Travel situations

Travelling is associated with a variety of factors concerning duration, destination, and motive which have to be taken into account by the physician before initiating a systemic therapy.

Working patients with travel activities need medication that is easy to transport and does not require complex application, frequent laboratory controls or short intervals between doctor’s visits. Understandingly, patients want to be flexible with short business trips over a few days or with compulsory appointments, especially at short notice. In case of international travelling, the transport of drugs in airplanes, as well as transfer times need to be considered. Obligatory customs declaration forms should be kept in mind, too. According to German law, it is permitted to carry drugs in adequate amounts for personal use. Exceptions are prohibited substances, such as doping substances or counterfeit drugs. Special guidelines must be observed for narcotics [3, 4]. Current information for the country of destination must be obtained from the respective embassy.

In general, good hygiene standards can be maintained while on business trips, and business travellers have got a

familiar, though variable depending on the country of travel, infrastructure at their disposal. However, patients in the transportation industry, such as trucker, often drive long hours, have not got facilities for cooling, and cannot comply with short consultation intervals.

In contrast to the aforementioned business trips, private trips usually are planned well in advance and in such detail that the needs of the patient's medical treatment can be fulfilled. The itinerary, as well as accommodation and means of transport, is often planned in detail in advance, and the average duration of the trip is between a week, or a few weeks. Therefore, it is possible to adjust the travel itinerary to the course of disease, and its treatment and medication needs. Location and climate zone can be selected according to individual tolerability. A new trend in travelling are adventure travels, as well as gap years or sabbaticals for several months, comprising ample travel planning across countries. However, on occasion, accommodation is chosen spontaneously and on the spot. When planning travels of this type, different climatic conditions and standards of hygiene have to be considered. Furthermore, adequate medical care for the patient is not a matter of course in all of the countries which are the destinations of adventure trips. The popularity of travels according to the principle "the journey is the reward" is also growing. This type of travel can be as diverse as a luxury cruise on a cruise liner with high standards in medicine and hygiene, or an individual journey with in some cases limited equipment and accessibility of facilities, such as cruises on a sailing boat. Therefore, the options for a therapy adjusted to the characteristics of the intended trip have to be discussed with the patient.

Variety of systemic drugs for moderate to severe psoriasis

The advantage of classical oral drugs for treatment of psoriasis, such as ciclosporin, fumarate/dimethyl fumarate, and acitretin, is that they are of tablet formulation and, therefore, are easy for the patient to carry, do not require cooling and can be taken along in large amounts for longer journeys. The medical appointments needed for safe treatment are manageable with intervals of four to up to twelve weeks, subject to good adjustment to the treatment (Table 1). Based on our experience, we recommend regular controls for a decrease in side-effects and a detection of side-effects at an early stage, although prescribing information allow a more flexible schedule of laboratory controls [5].

Carrying orally administered cortisone preparations, as well as classical NSAIDs or COX-2 inhibitors as so-called short-term *rescue* therapy to avoid arthritic relapses is also practicable. Given that the product information for apremilast and some biologics does not demand fixed laboratory controls, the listed recommendations are based on guidelines. Doctor's visits need to be adjusted individually and thus may recommend more frequent controls for some patients.

Methotrexate (MTX) can be administered both as tablets or by syringe/pen. The preferred application in a domestic environment is subcutaneous rather than oral administration, providing a better bioavailability of MTX by the former method. Oral administration results in variable bioavailability, influencing the efficacy of the drug [8]. For travel purposes, temporary change from subcutaneous to oral administration may be temporarily considered. However, storage and transport options for MTX syringes are unsophisticated, as syringes may be stored at room temperature according to the product information. Similar to classical therapeutics, the phosphodiesterase inhibitor apremilast is administered in tablet form ulation. Therefore, it does not demand special transport and storage facilities and and is well suited for travelling.

However, treatment with protein-based drugs is different from the aforementioned. Systemic therapy for patients with moderate to severe psoriasis has been revolutionized by the biologics currently available from the group of TNFα and interleukin inhibitors. In compliance with guidelines, affected patients would receive regimens with biologics routinely [6]. Antibodies demand meticulous storage and cooling, thus involving detailed planning of transfer times. Pharmaceutical manufacturers have provided varying instructions for storage of these drugs. Based on the product information, some biologics may be stored a few days (Taltz® [ixekizumab] up to 5 days) and in some cases up to two weeks (Humira® [adalimumab]) at temperatures of up to 25°C (ixekizumab up to 30°C). Other biologics have an absolute need for cooled storage (Stelara® [ustekinumab]). Furthermore, the information of the original product is not transferable to biosimilars. For adalimumab, statements on the non-refrigerated lifetime for biosimilars range from 14 days (Amgevita®, Hulio®, Hyrimoz®) to 28 days (Imraldi®) (Table 2). The stability of biologics is ensured by various additives that keep the antibodies in solution and buffer them to stabilise the active protein structure. Accordingly, we recommend for all biologics and biosimilars constant storage in a refrigerator at 2–8°C or in a transport box with cooling packs. Many companies and pharmacies already offer a cooling box upon request. However, transport temperatures in the cooling box are not guaranteed, and only a few suppliers provide detailed information on the timeframe within which sufficient cooling can be guaranteed under defined environmental conditions [9, 10].

When travelling by train, bus, car, or plane, transfer times and variations have to be taken into account. Given that cooling boxes cannot ensure cooling for trips lasting several hours, connection to the electrical system of the vehicle may be required. On a plane, the flight crew may provide the

Table 1 Routine laboratory controls under systemic therapy [6].

	Laboratory parameter	Before therapy start	After 4 weeks	After 8 weeks	After 12 weeks	Then every 3 months
Acitretin	Blood counts, liver and kidney function, serum lipids	X	X	X	X	X
	Pregnancy test	X	Continuously, every 4 weeks			
	Fasting blood glucose	X	Initially, more frequent controls			
Ciclosporin	Blood counts, liver and kidney function	X	X	X	X	X
	Uric acid	X		X		X
	Pregnancy test	Recommended[a] [6, 7]				
Fumarate/ dimethyl fumarate	Blood counts, liver and kidney function, serum lipids	X	X	X	X	Fumarate continuously every 4 weeks[b], dimethyl fumarate every 3 months[b]
Methotrexate	Blood counts, liver and kidney function	X	After therapy start, week 1 and week 4, then with good adjustment every 6 to 12 weeks			
	Hepatitis serology, procollagen-III peptide	X				
Interleukin inhibitors (IL-17, IL-23, IL-12/23)[c]	Blood counts, liver and kidney function	X	X	For therapy with infliximab, laboratory controls recommended before each administration, every 8 weeks	X	X
	Hepatitis serology	X				
	Pregnancy test[a]	Recommended [6], since then extended approval of adalimumab and certolizumab pegol during pregnancy				
	HIV serology	X[a]				
Apremilast[c]	Blood counts, liver and kidney function [6]	X	X		X	X
	Pregnancy test	X				

[a]Individual therapeutic decision; [b]according to product information; [c]according to product information, currently no uniform laboratory controls required during therapy with biologics. Regular examinations are, however, recommended by the guideline group. Depending on clinical situation, fewer or additional interventions/laboratory tests may be required. These must be selected individually for each patient.

Table 2 Lifetime and storage of biologics and biosimilars, using adalimumab as an example, according to product information in Europe.

Brand name of adalimumab	Lifetime of prefilled syringe/pen according to product information of manufacturer (as of April 01, 2020)
Amgevita®, Hulio®, Humira®, Idacio®	2 years at 2–8°C; only prior to use, syringes/pens may be stored for up to 14 days at a maximum temperature of 25°C
Hyrimoz®	30 months at 2–8°C; only prior to use, syringes/pens may be stored for up to 14 days at a maximum temperature of 25°C
Imraldi®	3 years at 2–8°C; only prior to use, syringes/pens may be stored for up to 28 days at a maximum temperature of 25°C

opportunity to store drugs (in small amounts) in the onboard refrigerator. However, this matter should be discussed with the respective airline prior to the flight.

Administration intervals of drugs

Orally administered and systemically acting drugs are usually taken in a self-reliant manner either daily or weekly. Administration, therefore, is controlled and managed by the patient. Given the short half-times, dosages of MTX, ciclosporin, fumarate/dimethyl fumarate, or corticoids are rapidly adjustable to the corresponding inflammatory activity of the disease. We do not initiate a dose-increase phase (for example, for fumarates or apremilast) during a scheduled journey. This applies in particular to dimethyl fumarate with its frequent gastrointestinal side effects.

As to the biologics, the situation is different due to their considerable range in administration intervals and half-lifes (Figure 1). As for interleukin-23 blockers in particular, injection intervals can be adjusted by a few days, due to their large intervals between individual applications, if there is sufficient prior notice and information on a stipulated journey. Thus, concerns about transport, cooling, and storage of the drug during the trip can be eliminated. In addition, a single extension of an interval by 1–2 weeks, with otherwise regular intervals of 8–12 weeks, is usually well tolerated, and in our experience does not lead to loss of efficacy of the drug. A longer injection interval will relieve employed persons with frequent unplanned travel activities.

Customs regulations for systemic drugs

For travel by air, the check-in of syringes and pens as hold luggage is not recommended, given that the climatic conditions are not guaranteed in the luggage compartment of the aircraft. For transport in carry-on luggage, the traveler should obtain a so-called travel letter or doctor's note that includes the substance declaration and a short medical urgency declaration. This should be issued in English at least, possibly in the respective language of the destination, as well, and should contain the name of the prescribing physician/medical contact person for the medication (Figure 2). Even if the patient has a tablet formulation, a declaration may be advisable during a potential security check to certify that the drug is required for personal use and is not a prohibited substance.

Travel considerations on location

For travels with fixed residence in urban areas, the storage of drugs requiring refrigeration usually is unsophisticated, given the availability of a minibar or refrigerator. Even in this case, however, protection of the medication against unauthorized access (public refrigerator) and a constant temperature have to be ensured. At no time should the liquid in the syringe be allowed to freeze, as freezing may affect the stability of the protein, thus precluding its administration [11–14]. The original container of the medication should be kept at all times, and a suitable storage location should be requested at the travel agency or hotel prior to the journey. In case of round trips or travels to rural areas with uncertain infrastructure, the mode of administration has to be discussed with the patient before departure and, if possible, replacements with an oral alternative should be planned well in advance. In countries with low standards of hygiene, sufficient amounts of swabs, plasters and disinfection spray should be included in the luggage, as availability on location may be limited.

With respect to the disposal of syringes, it is advisable to inform the respective cleaning staff about the administration in order to avoid unpleasant situations and accidental punctures. Some pharmaceutical manufacturers offer small disposal containers that the patient can order directly from the company. However, most injection systems and prefilled syringes are provided with sharps injury prevention features, thus minimizing the risk of accidental puncture.

Climatic and medical conditions in various countries of travel

Patients with psoriasis usually choose warm and dry climate zones for holiday trips (Dead Sea, Mediterranean region, Pacific Islands). They have experienced the positive effect of

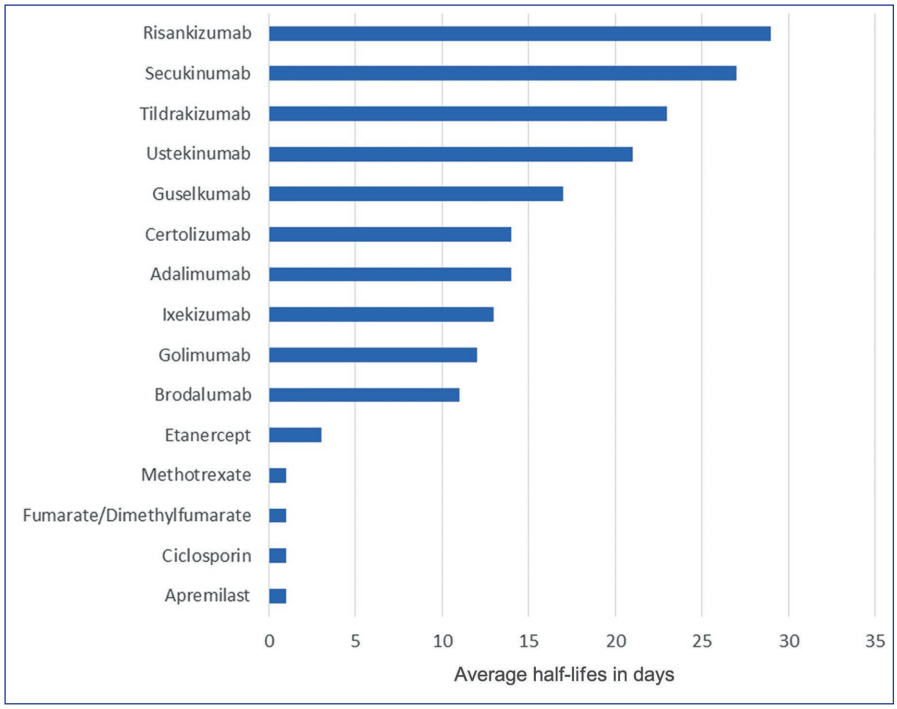


Figure 1 Half-lifes of systemic therapeutics for psoriasis.

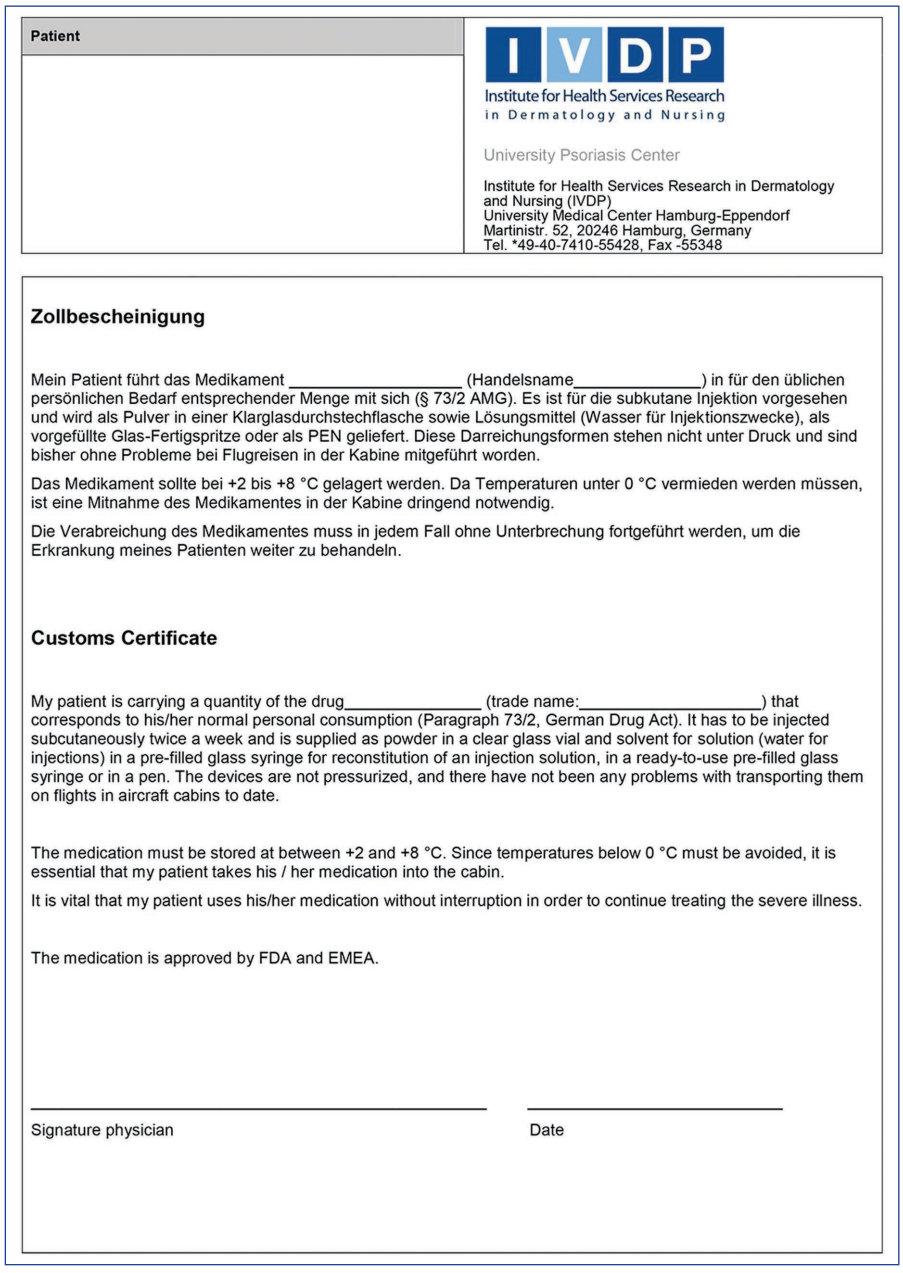
light and brine in balneophototherapy or have been informed about it through patient platforms and the media [15–17]. However, even in climate zones with sunny, warm, and humid conditions exacerbations of psoriasis in form of paradoxical photoaggravation may occur [18]. Especially with the additional application of topical, occluding ointments during systemic therapy may result in dysbalance of the epidermal barrier functions, already impaired by the disease [19]. Even after good adjustment of systemic therapies, side effects or paradoxical reactions may occur later in the course of the disease regardless of travelling [20]. Basic care should be less occlusive with higher humidity and temperature; we recommend creams and lotions without oily ingredients. Application and expected effects of any topical medication carried along should be discussed with the patient. Under extreme conditions, for example a trekking tour through the Sahara or an expedition in the Amazon region, the selection of suitable clothing is as important as the selection of medication for the trip. In rural areas, it should be assumed that no specialized medical care will be available in case of disease exacerbation. Patients should be furnished with explanatory information, they can produce should a case of emergency arise. This information should be in English or, ideally, in the respective language of destination, and should contain references to the disease, as well as information on the non-infectious nature of the skin condition, and suitable medication for treatment. In addition to the information provided by tour operators, patients can nowadays find helpful links through common web portals and patients of all age groups have access to digital resources [21].

When travelling to a world metropolis, the availability of modern medical care may be assumed. However, insurance and financial aspects of medical care in countries of travel need to be settled in advance. If necessary, the travel health insurance coverage should be updated.

It is advisable to supplement the regular travel first-aid kit containing antiallergics, disinfectants, wound care products and anti-infectives with some drugs to alleviate potential side effects of systemic therapy. Examples include antidiarrheal agents against gastrointestinal symptoms of fumarate therapy, proton-pump inhibitors for cortisone therapy, and phytotherapeutics for dyspeptic symptoms. Certainly, we only recommend taking medication known by the patient and tolerated well up to the time of travel to avoid being confronted with new side effects in remote regions.

Prevention of country-specific diseases – travel vaccinations

In every country, there are specific destination-dependent risks of infection. Before departure, the patient should, therefore, consult an agency with expertise in travel/tropical medicine to assess the risks in relation to their disease. This consultation should include universal, general medical risks. As both chronic disease and systemic therapy may increase



Patient

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Zollbescheinigung

Mein Patient führt das Medikament _____ (Handelsname_____) in für den üblichen persönlichen Bedarf entsprechender Menge mit sich (§ 73/2 AMG). Es ist für die subkutane Injektion vorgesehen und wird als Pulver in einer Klarglasdurchstechflasche sowie Lösungsmittel (Wasser für Injektionszwecke), als vorgefüllte Glas-Fertigspritze oder als PEN geliefert. Diese Darreichungsformen stehen nicht unter Druck und sind bisher ohne Probleme bei Flugreisen in der Kabine mitgeführt worden.

Das Medikament sollte bei +2 bis +8 °C gelagert werden. Da Temperaturen unter 0 °C vermieden werden müssen, ist eine Mitnahme des Medikamentes in der Kabine dringend notwendig.

Die Verabreichung des Medikamentes muss in jedem Fall ohne Unterbrechung fortgeführt werden, um die Erkrankung meines Patienten weiter zu behandeln.

Customs Certificate

My patient is carrying a quantity of the drug_____ (trade name:_____) that corresponds to his/her normal personal consumption (Paragraph 73/2, German Drug Act). It has to be injected subcutaneously twice a week and is supplied as powder in a clear glass vial and solvent for solution (water for injections) in a pre-filled glass syringe for reconstitution of an injection solution, in a ready-to-use pre-filled glass syringe or in a pen. The devices are not pressurized, and there have not been any problems with transporting them on flights in aircraft cabins to date.

The medication must be stored at between +2 and +8 °C. Since temperatures below 0 °C must be avoided, it is essential that my patient takes his / her medication into the cabin.

It is vital that my patient uses his/her medication without interruption in order to continue treating the severe illness.

The medication is approved by FDA and EMEA.

_____ _____

Signature physician Date

Figure 2 Travel letter.

the likelihood for infections, especially of the upper respiratory tract, a individual consultation regarding the disease is also recommended [22, 23]. Susceptibility to infection may vary depending on the drug group. Thus, based on current knowledge and according to our own experience it can be stated that patients treated with interleukin-17 or interleukin-23 inhibitors are less prone to infections of the respiratory tract than those treated with TNFα inhibitors (in particular adalimumab and infliximab) [24]. Infections that can be avoided by vaccinations must be considered individually for each country of destination.

Some infections transmitted by vectors such as malaria and dengue cannot (yet) be prevented by vaccination [25]. Accordingly, all travelers should be advised to use effective mosquito protection. The risk of mosquito bites should be reduced by bringing along sufficient quantities of effective repellents and impregnated clothing. In this regard, the patient should be advised to prepare his or her trip conscientiously and in good time. Medical information about travel destinations is provided, for example, on the internet pages of the German Federal Foreign Office and the Bernhard Nocht Institute for Tropical Medicine (BNIMT) [26, 27]. Consulting

a physician specialized in travel medicine as to whether the trip will lead through a malaria region and whether medicinal prophylaxis is indicated in addition to good mosquito protection, is also recommended. In this context, potential drug-drug interactions should be considered [28].

In general, sufficient vaccination according to current guidelines has to be ensured before initiating immunomodulatory systemic medication [23, 29]. This includes both basic immunizations, as well as recommended booster vaccinations. For some diseases, such as measles, vaccination coverage of the population and accordingly of our patients is insufficient. In Germany, this led to the introduction of the new Measles Protection Act on March 01, 2020 [30]. The ECDC (*European Center for Disease Prevention and Control*) illustrates the international prevalence of measles [31]. Vaccination gaps should be closed in due time before initiating the systemic therapy, and vaccinations should be documented [32]. This applies in particular to live vaccinations such as measles/mumps/rubella, varicella and yellow fever, the administration of which may be contraindicated after initiating immunosuppressive systemic therapy or complicated by mandatory time intervals [23, 33]. Recommendations require a four-week interval after live vaccination before initiating immunosuppressive systemic therapy. Once the systemic therapy has started, the required interval between the last therapeutic dosage and administration of the live vaccine is dependent on the respective therapeutic agent and its half-life. For example, after administration of the biologic etanercept (TNFα inhibitor with a short half-life of 3 days), an interval of at least two months before administration of a live vaccine is recommended [23], while at least 21 weeks are recommended for risankizumab (interleukin-23 inhibitor with a long half-life of 29 days) (Figure 1). Here, manufacturer information sheets for the various products vary from general exclusion of live vaccination to specification of recommended intervals after which live vaccination is feasible (Table 3).

According to expert consensus, patients should not be immunized with live vaccines during ongoing therapy with immunosuppressants for treating autoimmune diseases or other chronic diseases, due to the risk of disease and severe to fatal complications posed by attenuated viruses [35–37]. Exceptions may only be possible in justified individual cases after risk-benefit assessment [23].

Due to insufficient global vaccination coverage, cases of measles have risen dramatically in number in Europe and worldwide [38, 39]. This has significantly increased the risk of an infection with measles for each individual. Given that travelling may pose an increased risk of infection, the medical travel consultation should always comprise serological verification of the vaccination status for measles and the protection against measles, respectively.

Inactivated vaccines (against diphtheria/tetanus/pertussis/polio, hepatitis A, hepatitis B, rabies) can be administered without safety concerns in cases of existing inflammatory chronic autoinflammatory disease, even under immunomodulatory systemic therapy [40, 41]. In particular for patients on immunomodulation, annual influenza vaccination, pneumococcal vaccination (recommended as sequential vaccination with the 13-valent conjugate vaccine [PCV13] Prevenar®, followed by the 23-valent polysaccharide vaccine [PPSV23, Pneumovax®] after 6–12 months), and vaccination against herpes zoster (inactivated vaccine Shingrix®) should be kept in mind [23, 42, 43]. While on immunosuppression, vaccines used for primary vaccination (for example hepatitis A vaccination before travelling) may result in an attenuated immune response [44, 45]. For these so-called neoantigens, serological verification of vaccination success 4–6 weeks after application is recommended, provided there is a serological correlate of protection [46]. The validation of successful immunization (and additional vaccinations, as required) should be considered at the planning stage before the travel.

Ideally, the medical travel consultation should take place before final booking and approximately 3–6 months before the scheduled departure [47]. If live vaccination is required, it may then be possible to interrupt the immunosuppression or plan other interventions, if necessary. In certain cases, it may not be possible to travel to yellow fever areas. Active and sufficient immunization should be verified after previously performed, single vaccinations. If a vaccination against yellow fever is required, the German Standing Committee on Vaccination (*Ständige Impfkommission*, STIKO) recommends a second vaccination against yellow fever, if sufficient immune response cannot be assumed after primary vaccination. This applies to children with primary vaccination at the age of up to two years, pregnant women, or individuals vaccinated against yellow fever and measles at the same time [48].

There is no need to maintain, for safety reasons, a specific interval between administration of an inactivated vaccine and an immunosuppressive medication. In our opinion, however, immunosuppressive therapy should ideally only start four weeks after administration of an inactivated vaccine to ensure a sufficient immune response. There are insufficient data on the optimal time for administration of an inactivated vaccine during ongoing systemic therapy. According to expert opinion, the aim should be the largest possible time interval between inactivated vaccine and biologic. The situation is different for some drugs utilized in oncology or rheumatology that act via B-cell depletion (for example, rituximab). After administration of such drugs, a long-lasting, severely impaired humoral immune response to vaccines (presumably accompanied with reduced efficacy of the vaccination) is to be expected. However, also in this case there are no safety risks regarding administration of an inactivated vaccine.

Table 3 Instructions for use and product information regarding live vaccinations under systemic therapy in Europe.

Drug	Product information of manufacturer about live vaccinations during systemic therapy	Recommendations according to STIKO 2019 [23]
Methotrexate	No live vaccinations during therapy.	According to expert consensus, methotrexate at low dose ≤ 20 mg/week is no contraindication for MMR, MMR-V, and varicella vaccination with Priorix®, PriorixTetra®, or Varilrix®; however, individual decision and off-label use. Contraindication during high-dose therapy, at least intervals of 4 weeks after vaccination and of 2 months before vaccination.
Ciclosporin	Vaccination with live vaccines should be avoided.	According to expert consensus, ciclosporin at low dose ≤ 2.5 mg/kg/d is no contraindication for MMR, MMR-V, and varicella vaccination with Priorix®, PriorixTetra®, or Varilrix®; however, individual decision and off-label use. Contraindicated in case of high-dose therapy.
Dimethyl fumarate	No contraindication for live vaccination.	Recommendation to administer live vaccines only in exceptional cases after individual consideration. Contraindication in case of pronounced lymphopenia.
Apremilast	No contraindication for live vaccinations.	Recommendation to complete live vaccinations 4 weeks before therapy start or to administer vaccines only after individual risk-benefit assessment.
Adalimumab	No live vaccinations during therapy. For infants exposed to adalimumab *in utero*, vaccination with live vaccines at the earliest after 5 months.	Contraindicated during ongoing therapy. Live vaccination at least 4 weeks before next dose and at the earliest 2 months after last dose. Vaccination of infants at the earliest 5 months after last exposure during pregnancy.
Etanercept	No live vaccinations during therapy.	Contraindicated during ongoing therapy. Live vaccination at least 4 weeks before next dose and at the earliest 2 months after last dose (in case of clinical remission already after 1 month). Vaccination of infants at the earliest 16 weeks after last exposure during pregnancy.
Certolizumab pegol	No live vaccinations during therapy.	Contraindicated during ongoing therapy. Live vaccination at least 4 weeks before next dose and at the earliest 2 months after last dose. Vaccination of infants at the earliest 5 months after last exposure during pregnancy.
Golimumab	No live vaccinations during therapy.	Contraindicated during ongoing therapy. Live vaccination at least 4 weeks before next dose and at the earliest 3 months after last dose. Vaccination of infants at the earliest 6 months after last exposure during pregnancy.
Infliximab	No live vaccinations during therapy.	Contraindicated during ongoing therapy. Live vaccination at least 4 weeks before next dose and at the earliest 3 months after last dose. Vaccination of infants at the earliest 6 months after birth.
Ustekinumab	No live vaccinations during therapy. Before vaccination with live vaccine at least interval of 15 weeks to last dose of ustekinumab, and next dose at the earliest 2 weeks after vaccination.	Contraindicated during ongoing therapy. Live vaccination at least 2 weeks before next dose and at the earliest 15 weeks after last therapeutic dose.

Table 3 Continued.

Drug	Product information of manufacturer about live vaccinations during systemic therapy	Recommendations according to STIKO 2019 [23]
Guselkumab	No live vaccinations during therapy. Before vaccination with live vaccine at least interval of 12 weeks to last dose, and next dose at the earliest 2 weeks after vaccination.	No specific reference[a]
Tildrakizumab	No live vaccinations during therapy. Wait at least 4 weeks after vaccination before initiating treatment with tildrakizumab. During and for at least 17 weeks after treatment with Ilumetri®, patients should not receive live vaccines.	No specific reference[a]
Risankizumab	No live vaccinations during therapy. No live vaccination for at least 4 weeks before start of therapy, during treatment and for at least 21 weeks after treatment.	No specific reference[a]
Brodalumab	Live vaccines should not be given concomitantly.	No specific reference[a]
Secukinumab	Live vaccines should not be given during therapy.	Contraindication during ongoing therapy. Vaccination at the earliest 2 months after last dose and at least interval of 4 weeks before next dose.
Ixekizumab	Ixekizumab should not be given concomitantly to live vaccines.	No specific reference[a]

[a]In general, for the majority of biologics insufficient data are available on evaluation of efficacy and risk of live vaccination during ongoing therapy. Accordingly, based on international expert consensus and current STIKO recommendation, live vaccination during therapy with these biologics is contraindicated [23]. For some biologics in low-dose setting, however, vaccination with the MMR and varicella vaccines Priorix®, PriorixTetra®, or Varilrix® may be considered after individual risk-benefit assessment [23]: This is, however, not recommended by the current version of the S2k guideline on therapy of psoriasis in children and adolescents [34].

Conclusion

Before departure, the patient should be advised about infection risks at the destination and during travelling. Travel consultation by a specialized center for travel or tropical medicine is recommended, and adequate vaccination is essential. Depending on the conditions of travelling, systemic therapy can be adjusted in advance as concerns both, dosage form and administration intervals. A careful selection, by the patient, of the desired destination in terms of infection risk and stress due to climate and local customs while travelling would be ideal.

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Drug information referred to November 15, 2019

Kyntheum® 210 mg injection solution in prefilled syringe: Leo Pharma GmbH, Cosentyx® 150 mg injection solution in prefilled syringe: Novartis Pharma GmbH, Taltz® 80 mg injection solution in prefilled syringe: Lilly Deutschland GmbH, Skyrizi® 75 mg injection solution in prefilled syringe: AbbVie Deutschland GmbH & Co. KG, Ilumetri® 100 mg injection solution in prefilled syringe: Almirall Hermal GmbH, Stelara® 90 mg injection solution in prefilled syringe: Janssen-Cilag GmbH, Xeljanz® 5 mg film-coated tablets: Pfizer Pharma GmbH, Simponi® 50 mg injection solution in prefilled syringe: MSD Sharp & Dohme GmbH, Amgevita® 40 mg injection solution in prefilled syringe: Amgen GmbH, Imraldi® 40 mg injection solution in prefilled syringe: Samsung Bioepis, Cimzia® 200 mg injection solution in prefilled

syringe: UCB Pharma GmbH, Humira® 40 mg injection solution in prefilled syringe: AbbVie Deutschland GmbH & Co KG, Enbrel® 50 mg injection solution in prefilled syringe: Pfizer Pharma GmbH, Otezla® 10/20/30 mg film-coated tablets: Celgene GmbH, Skilarence® 30 mg film-coated tablets: Almirall Hermal GmbH, Neotigason® 25 mg hard capsules: Puren Pharma GmbH & Co KG, Sandimmun® Optoral 100 mg soft capsules: Novartis Pharma GmbH, metex® 50 mg/ml injection solution, prefilled syringe 10 mg: medac GmbH, Prednisolon STADA® 50 mg tablets: STADApharm GmbH.

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